

Greenhouse Gas Measurement and Management T&T's Case Study

Regional Workshop on Metrology and Technology Challenges of Climate Science and Renewable Energy

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Presentation Outline

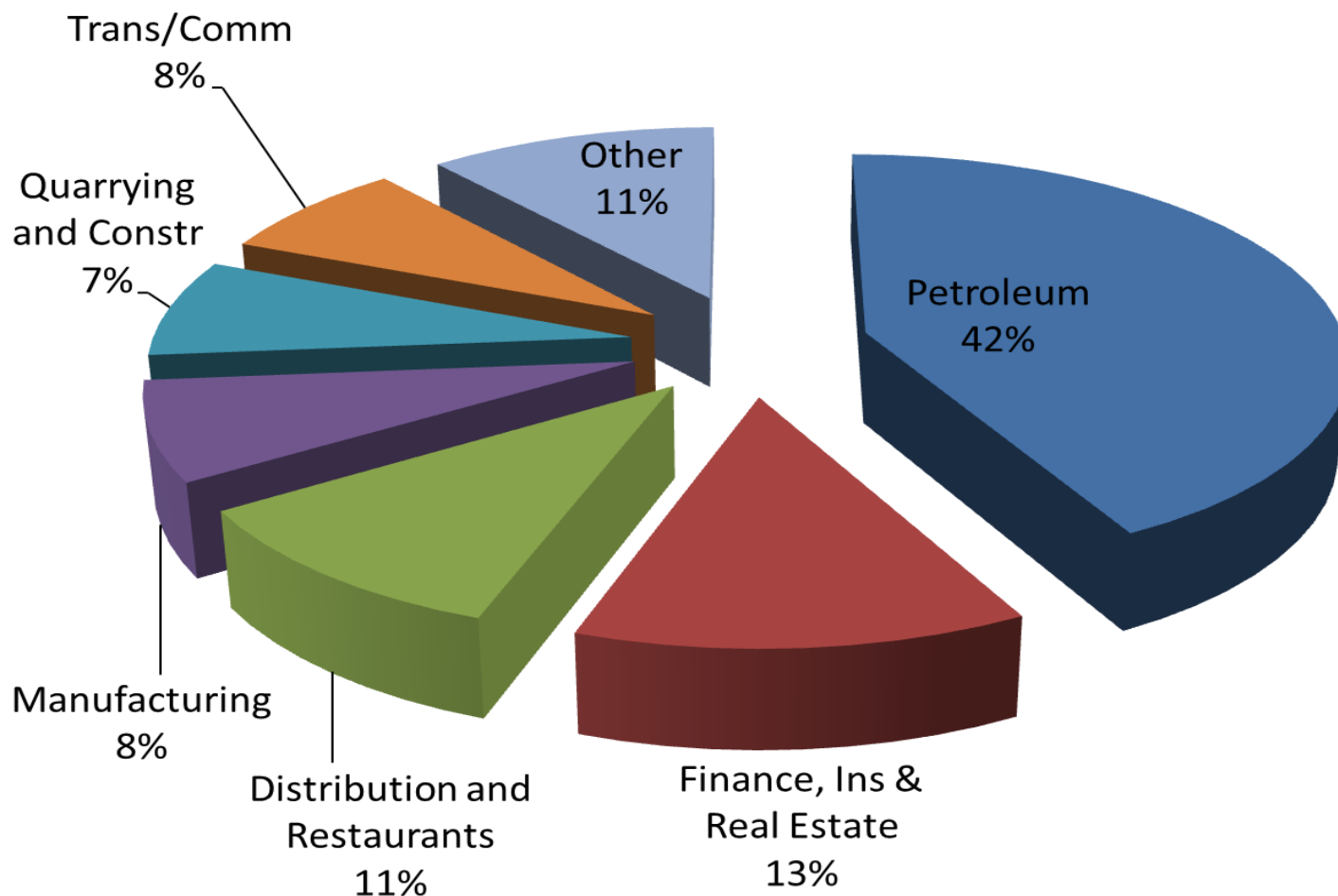
- T&T's Location
- T&T's Economy
 - Global comparison of some key indicators
- T&T's GHG Emissions
 - An illustration of T&T's unique position
- Some mitigation strategies and their potential impact on the economy
- Conclusions





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T&T's GDP by Sector (2012)



T&T's economy is largely energy dependent, with energy related industries accounting for over 50% of total GDP

T&T's Economy/ World Rank

	% of Economy	World rank
Industry	59.5	11
Agriculture	0.5	150
Services	40	142

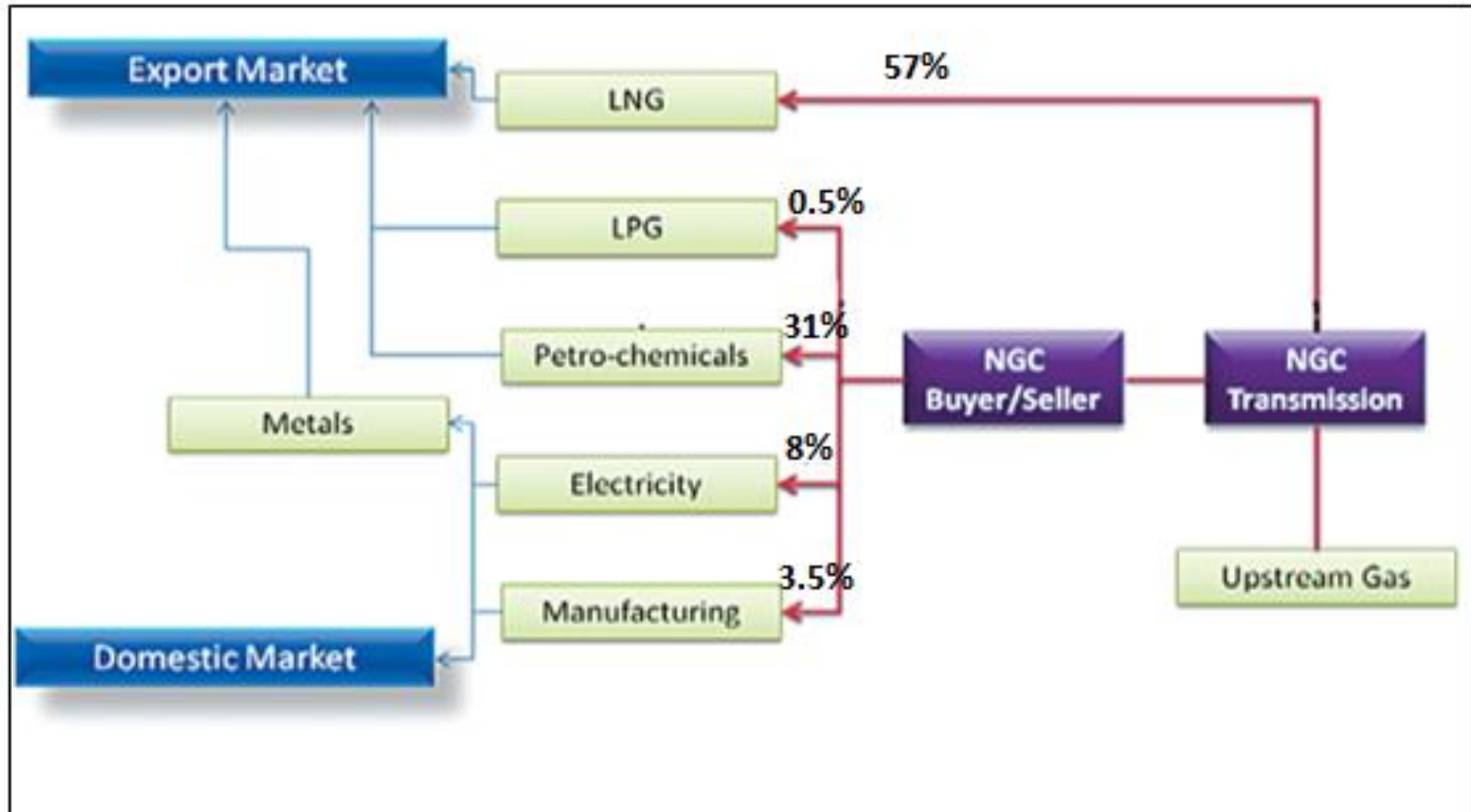
Some Important Energy Data for T&T (2014)

Primary Energy Form	Average Production	Proven Reserves	Reserve to Production Ratio (RPR)	Local Consumption
Oil	80,000 bbls/day	728.5 mmbbls	24.9 years	34%*
Natural Gas	4183mmscf/day	13 Tscf	8.5 years	43%* (approx)
TOTAL (BOE)	801,000 bbls/day	3000mmbbls		41%

If both commodities are standardised using barrel of oil equivalent (BOE), T&T's primary energy production is largely natural gas based (90%) compared to oil (10%).

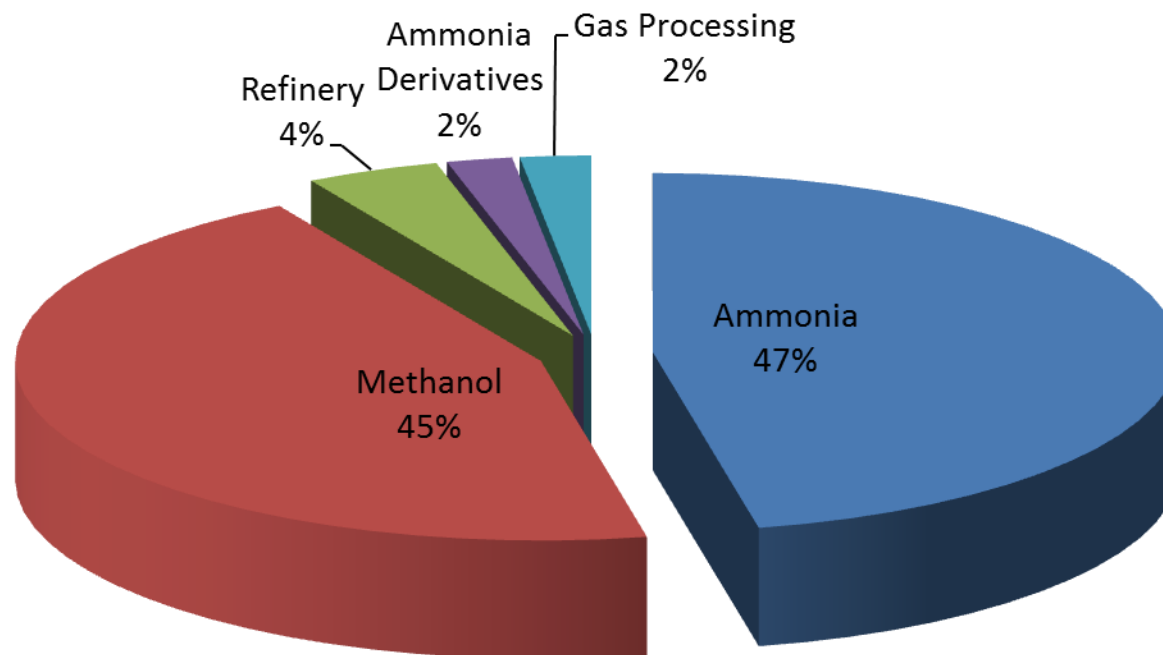
As such, though the previous slide stated the T&T economy to be energy based, we can reasonably conclude it to be **natural gas based**.

Natural Gas Production and Usage in T&T



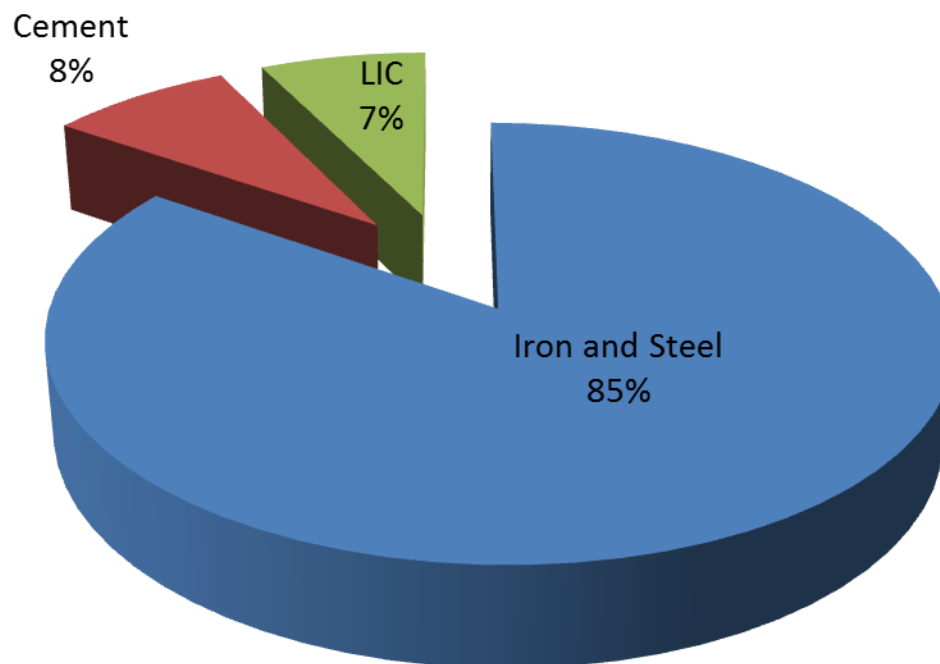
Please note most of the commodities manufactured in the petrochemical sector ($\geq 94\%$) are also exported.

Natural Gas Utilisation in T&T's Petrochemical Sector



In terms of natural gas consumption, the petrochemical sector in T&T is largely dominated by ammonia and methanol manufacture

Natural Gas Utilisation in T&T's Manufacturing Sector



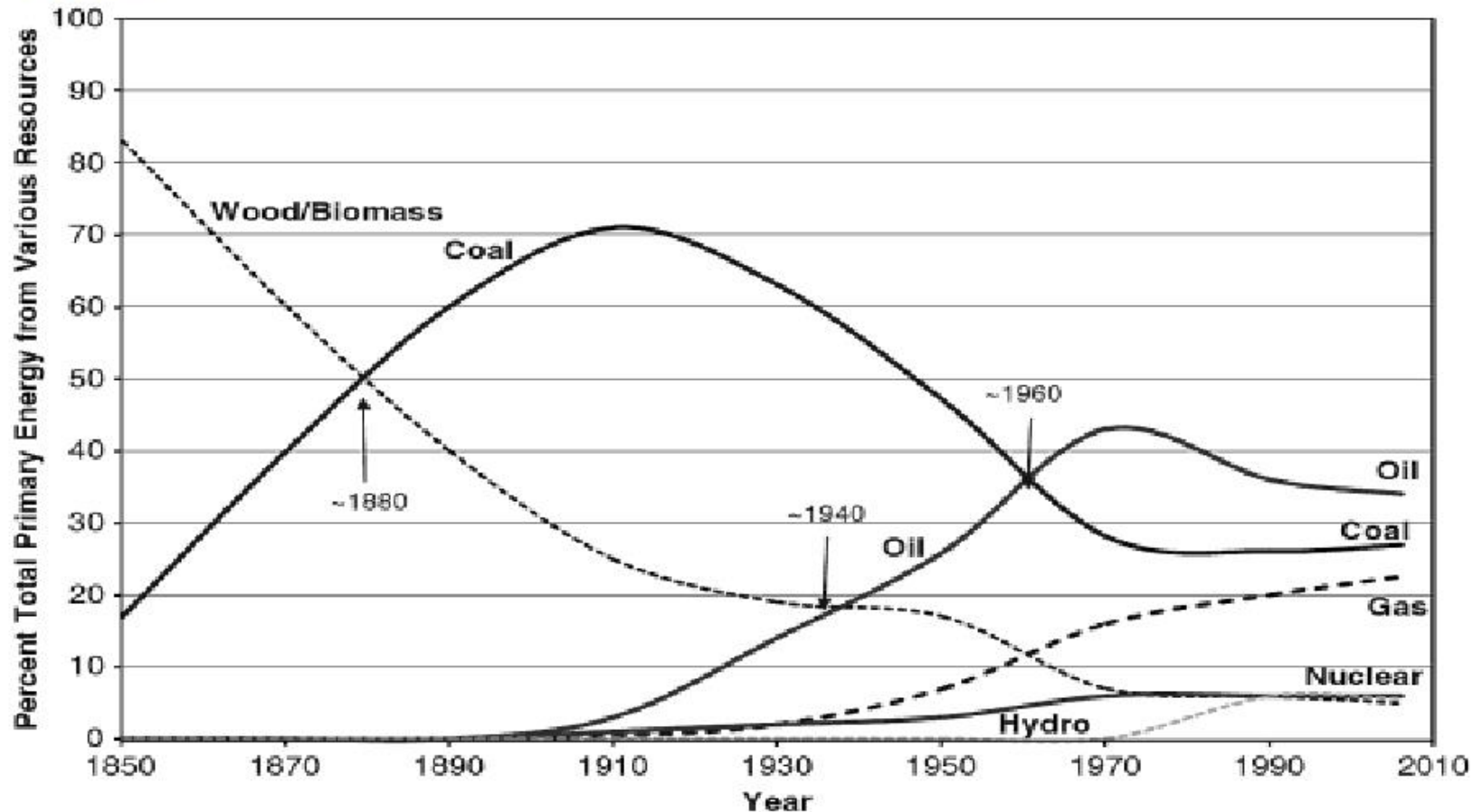
In terms of natural gas consumption, the manufacturing sector in T&T is largely dominated by Iron and Steel production

Related Energy Issues for T&T to Consider – “Elephant in the Room”

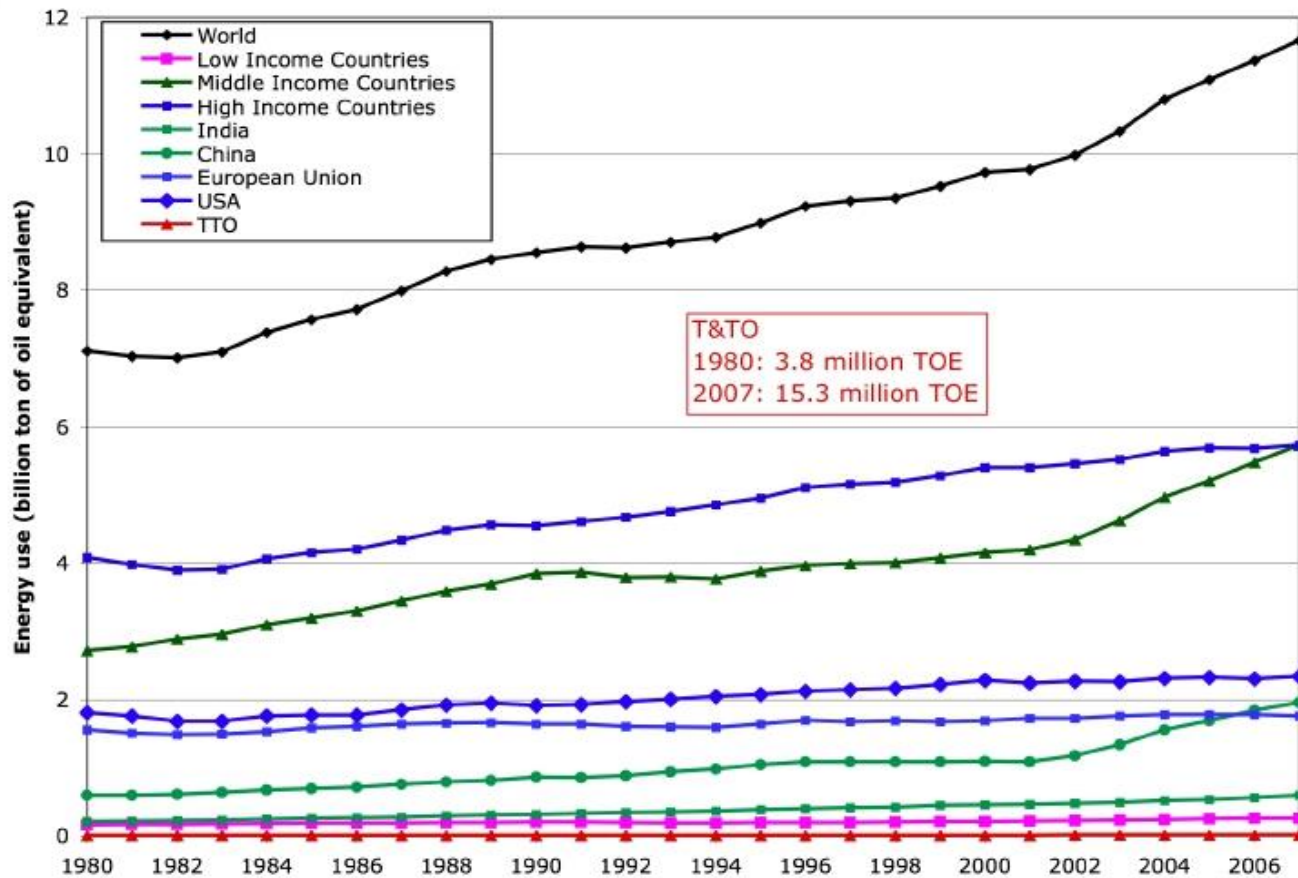
- **Dominant Non-Renewable Resource:** Over 80% of the world's energy is still from depleting resources (EIA, 2012).
- **Greenhouse Gas Emissions:** The atmospheric concentrations of CO₂_e are greater than they have been for the last 500,000 years.



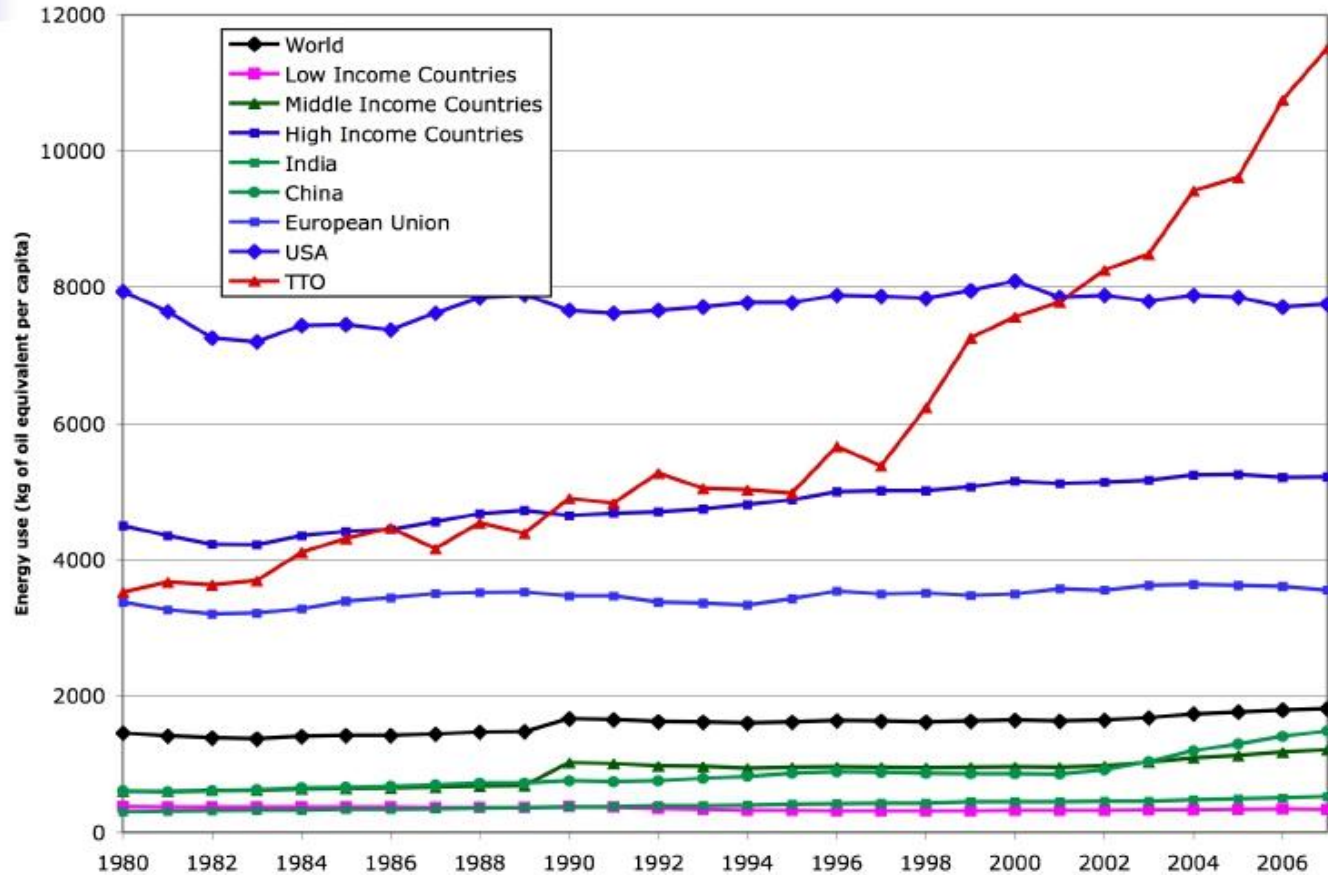
Changes in Shares of Energy since 1850



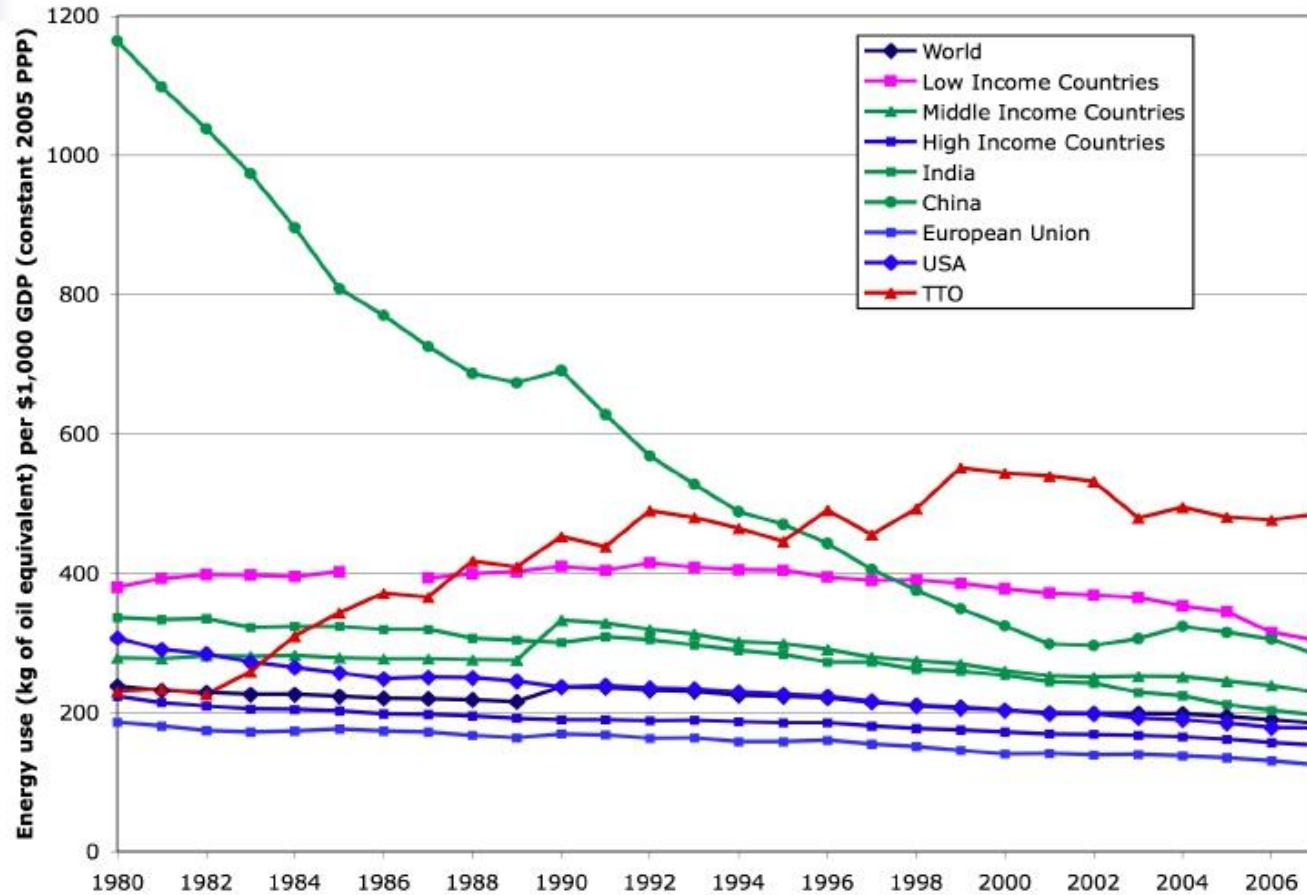
Evolution of Energy Use



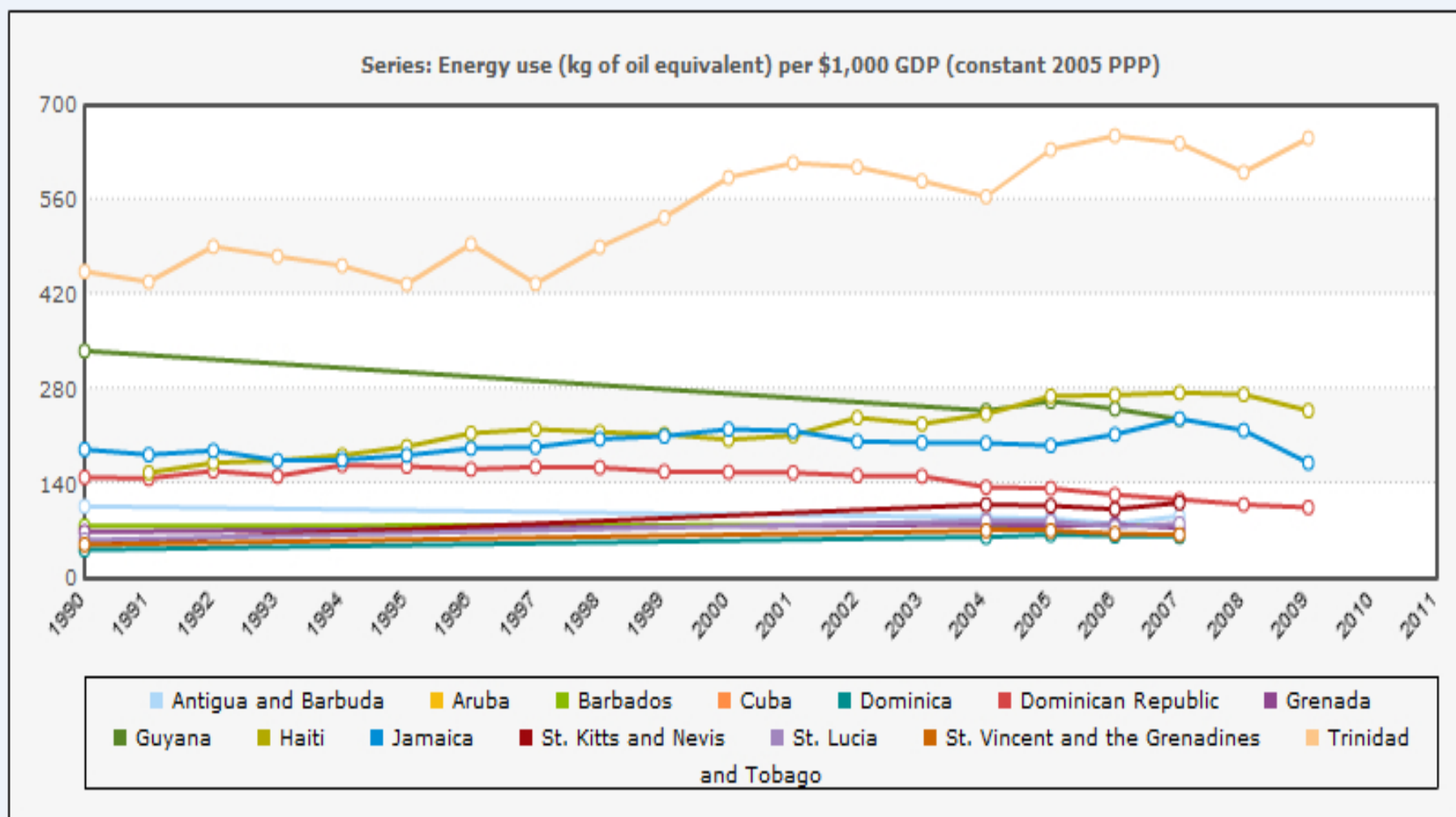
Evolution of Energy Use per Capita



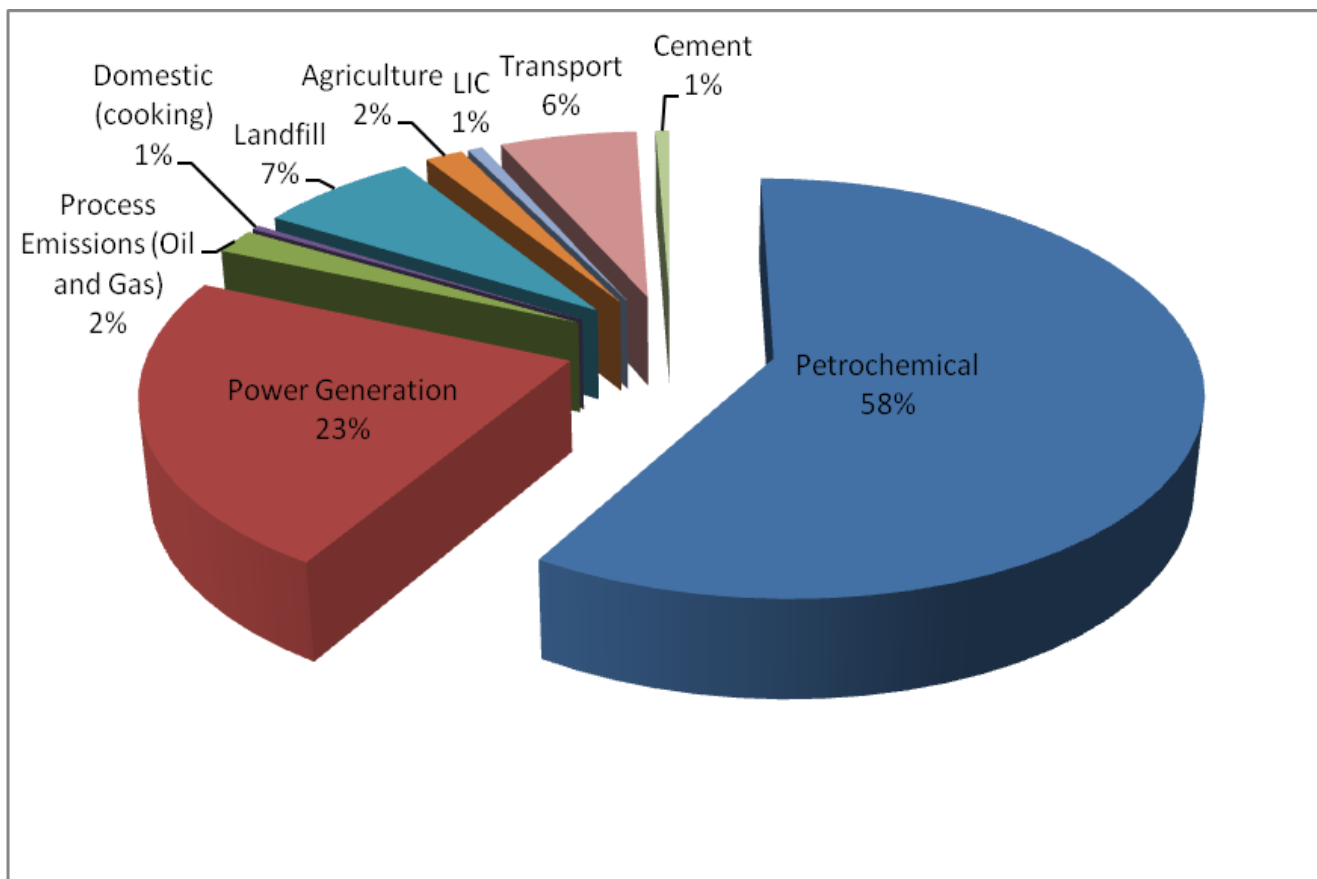
Evolution of Energy Use per GDP



Energy Use per GDP (The Caribbean)

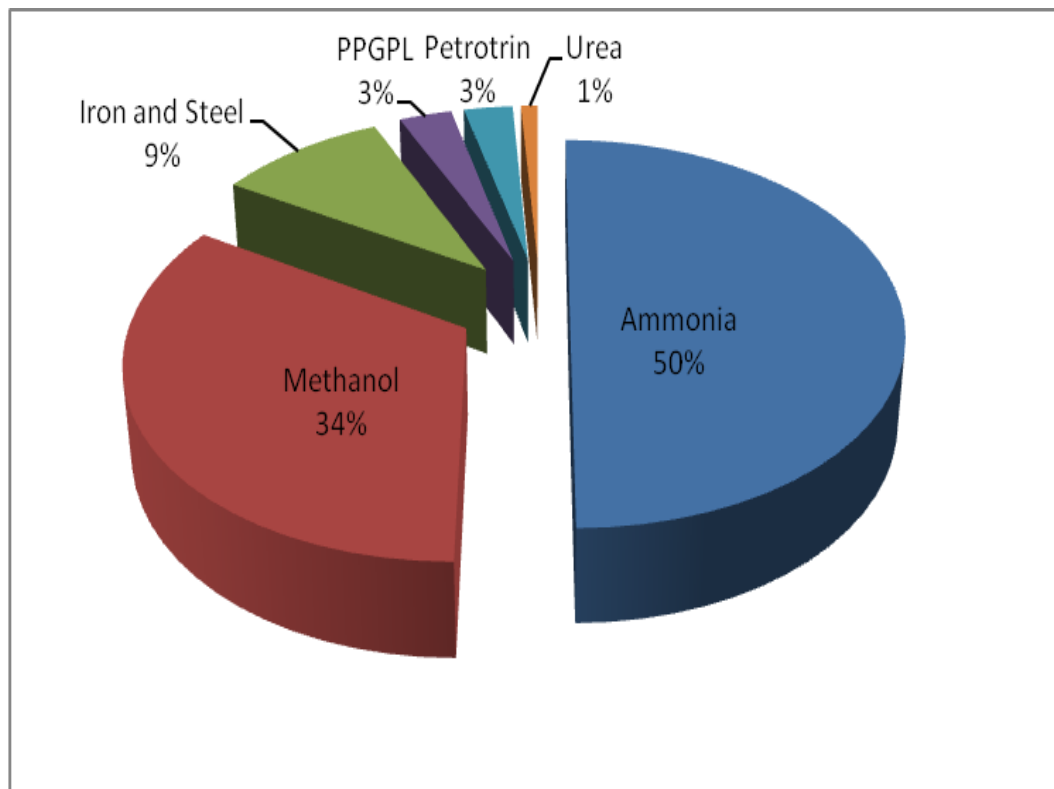


T&T's GHG Emissions by Sector



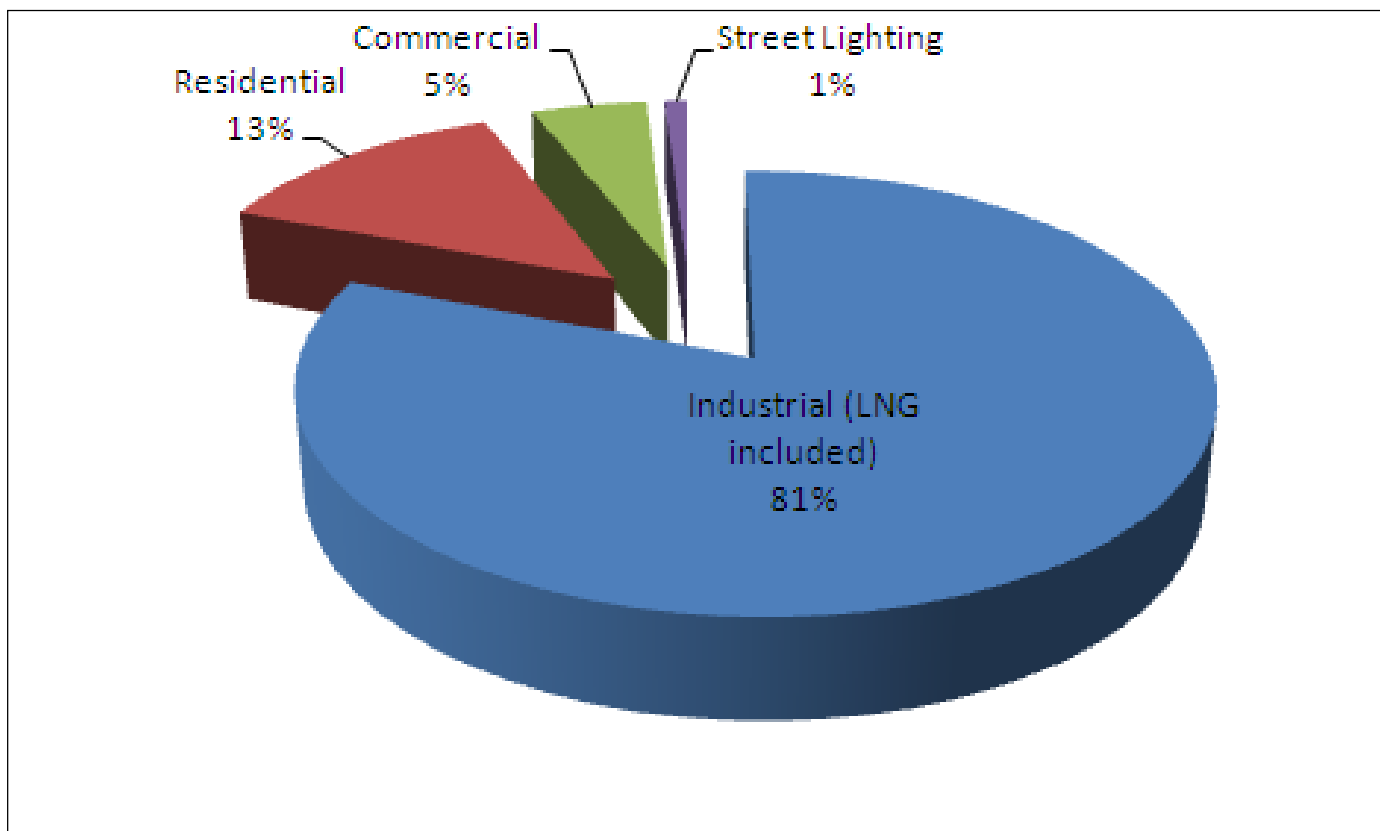
In 2010, **53** Million Tonnes of GHG emissions occurred in T&T. More than **80%** emanated from the Petrochemical and Power Sectors.

T&T's GHG Inventory, the Petrochemical Sector



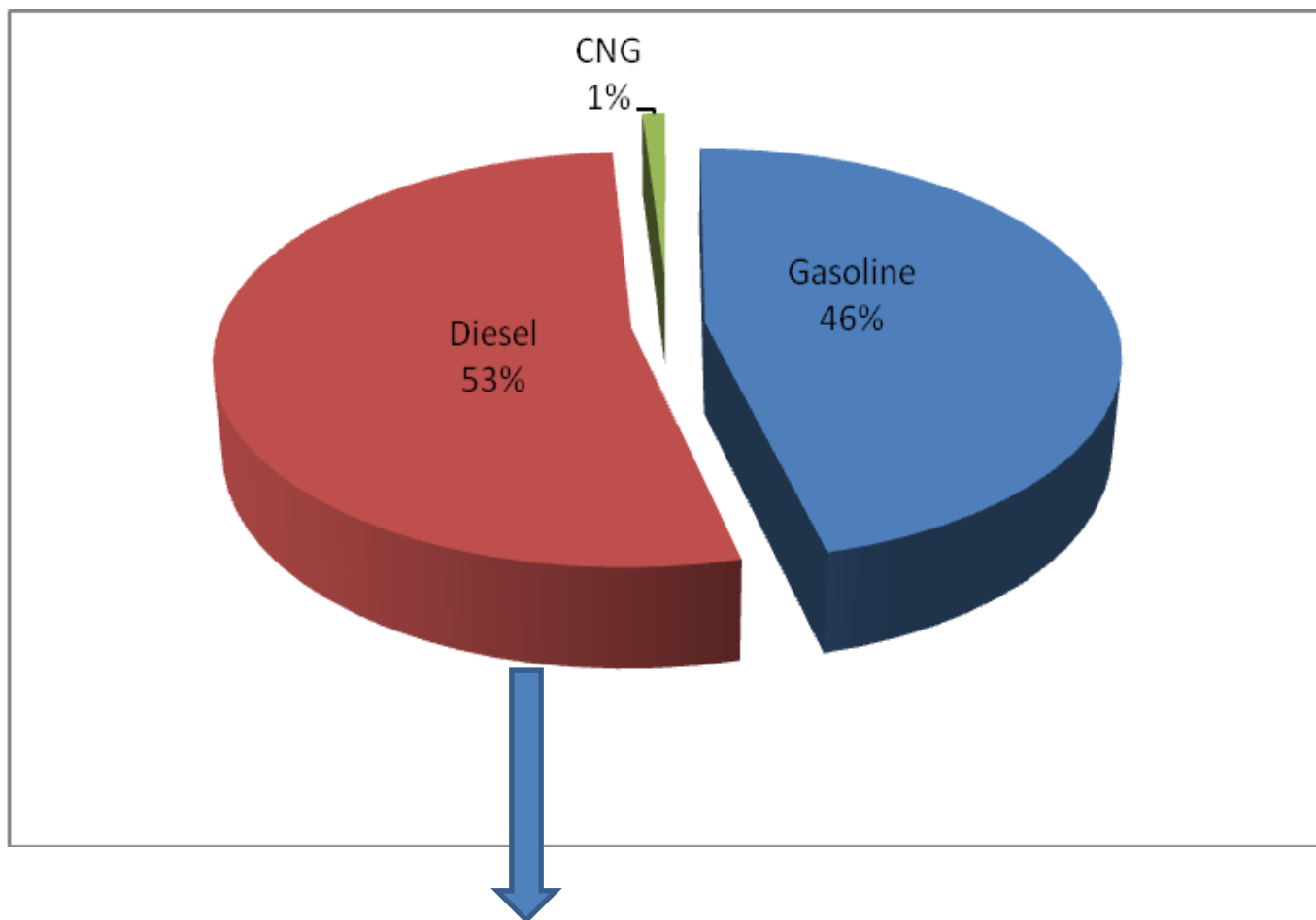
In 2010, within the Petrochemical Sector in T&T, more than **80%** of GHG emissions originated from Ammonia and Methanol Synthesis.

T&T's GHG Inventory, the Power Sector



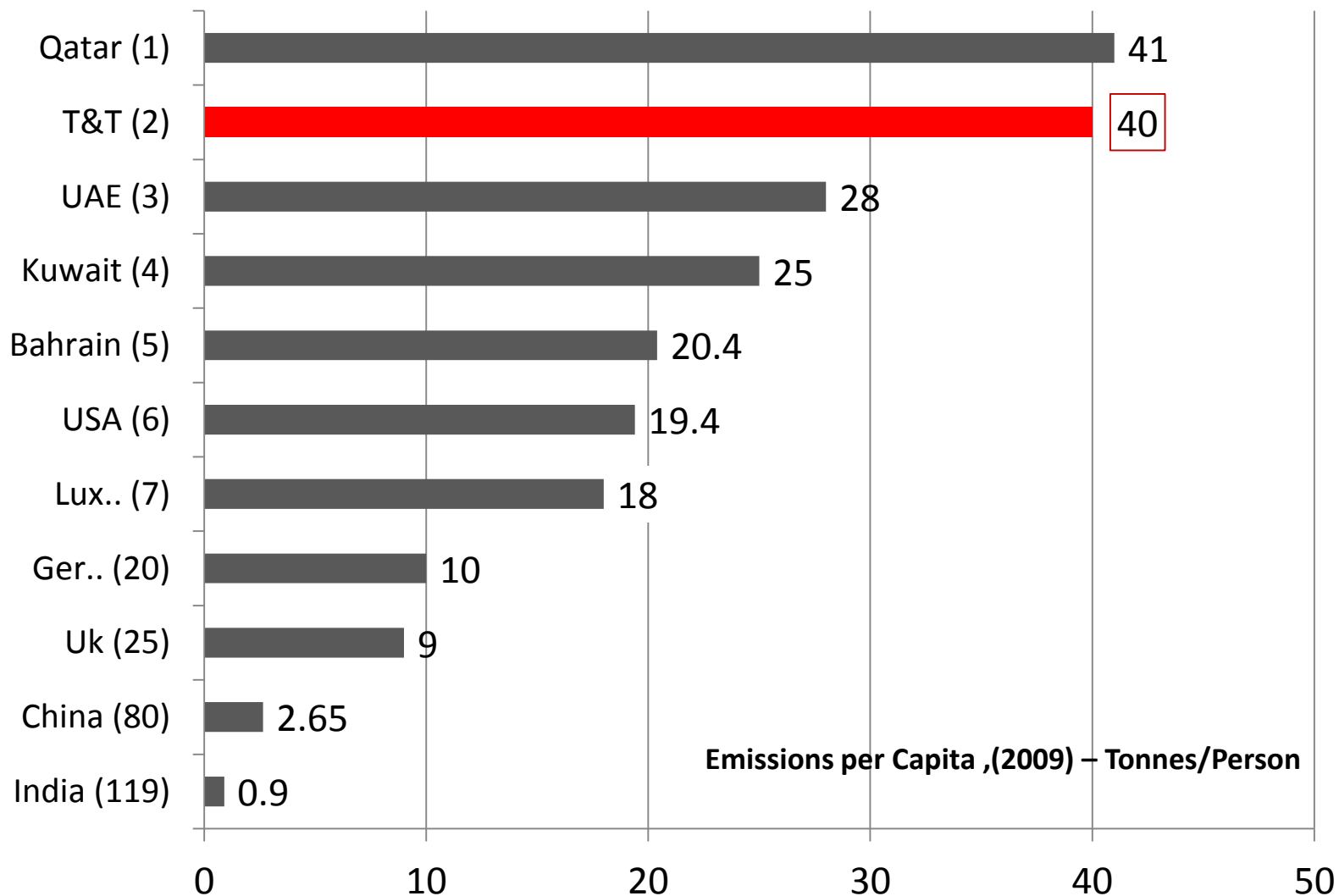
In 2010, within the Power Sector in T&T, more than **80%** of GHG emissions originated from Industrial consumption.

T&T's GHG Inventory, the Transport Sector

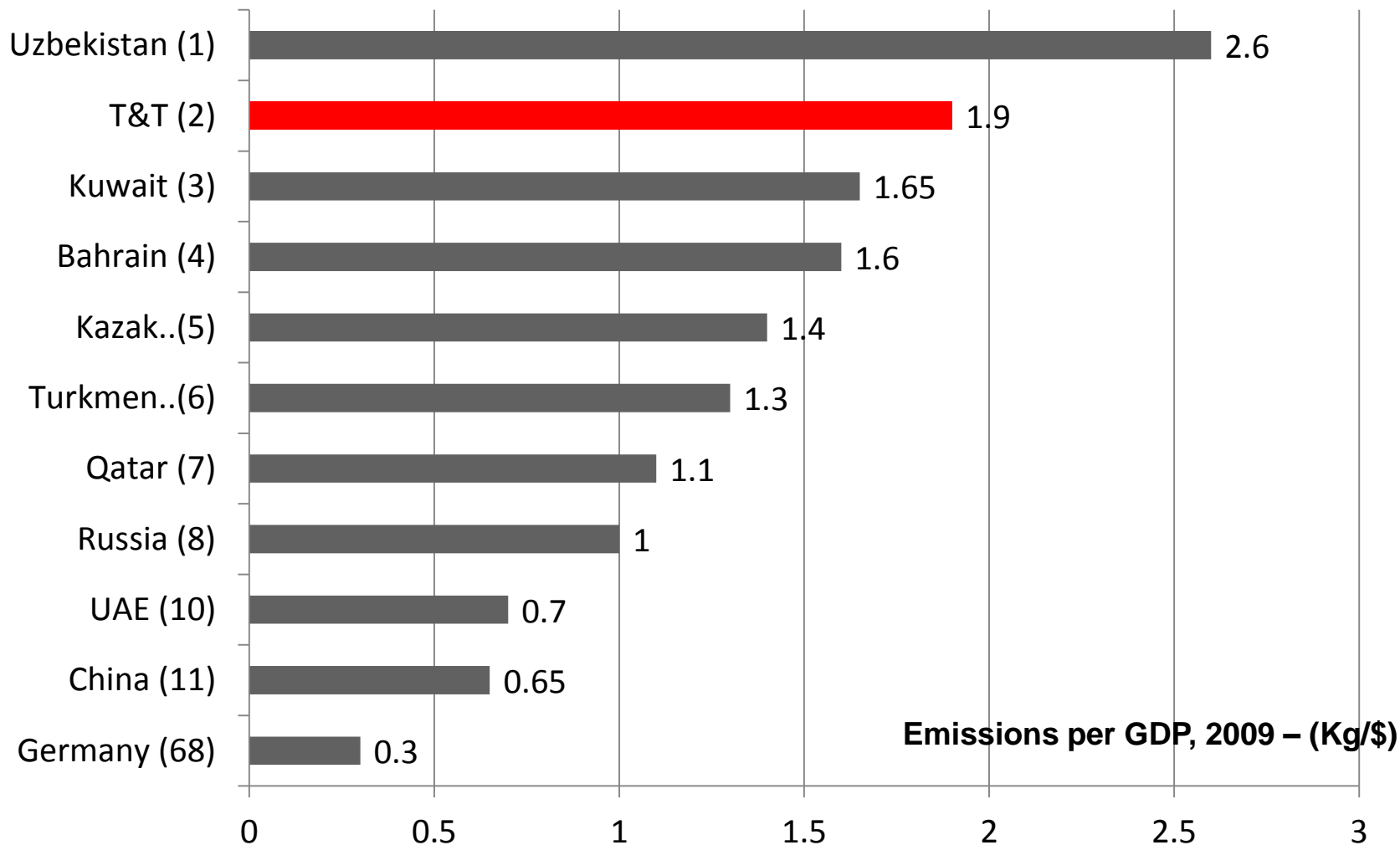


It is understood that a significant portion of this has been sold illegally and is consumed outside of T&T.

Emissions per Capita – UTT Study



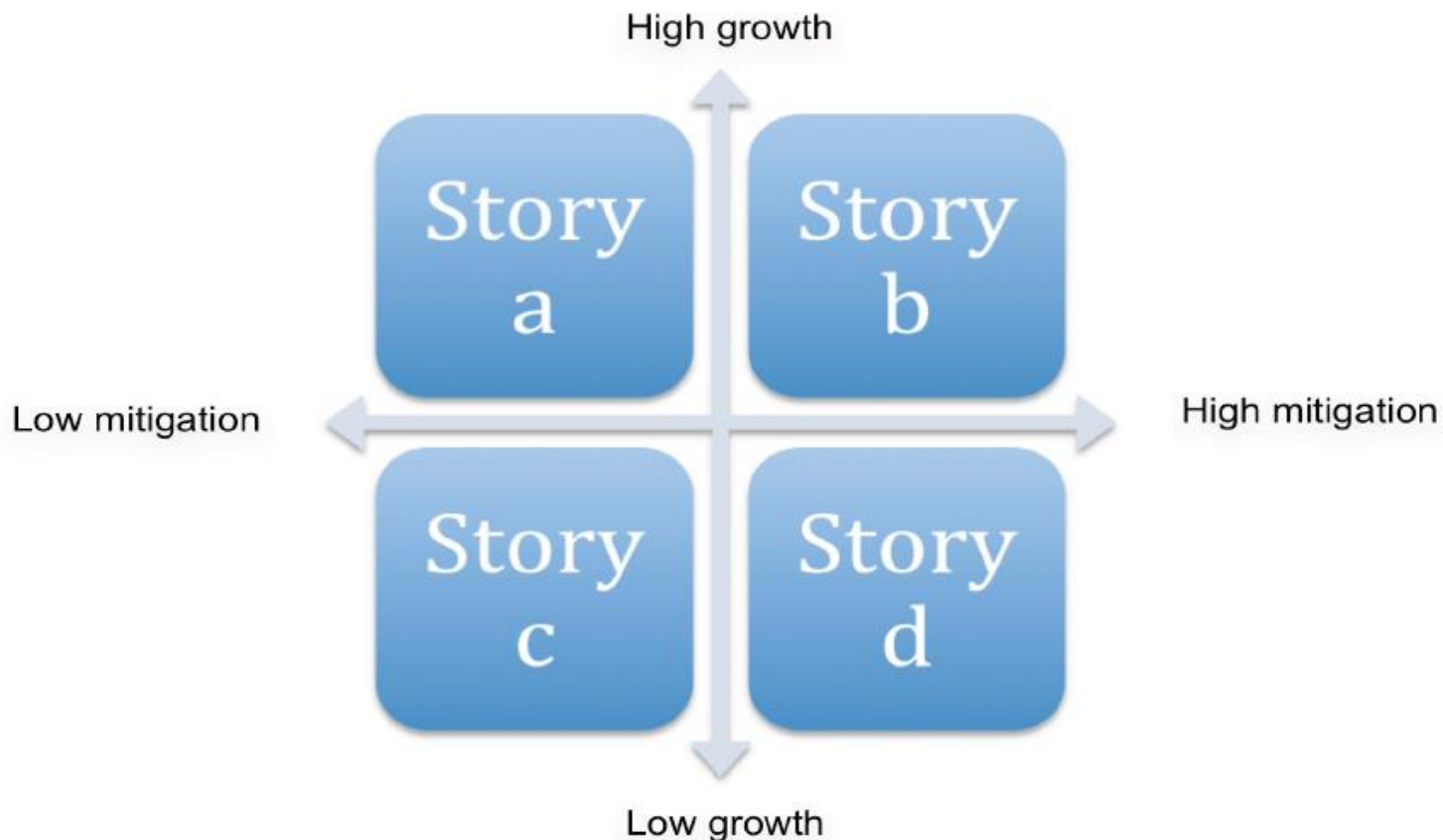
Emissions per Unit GDP – UTT Study



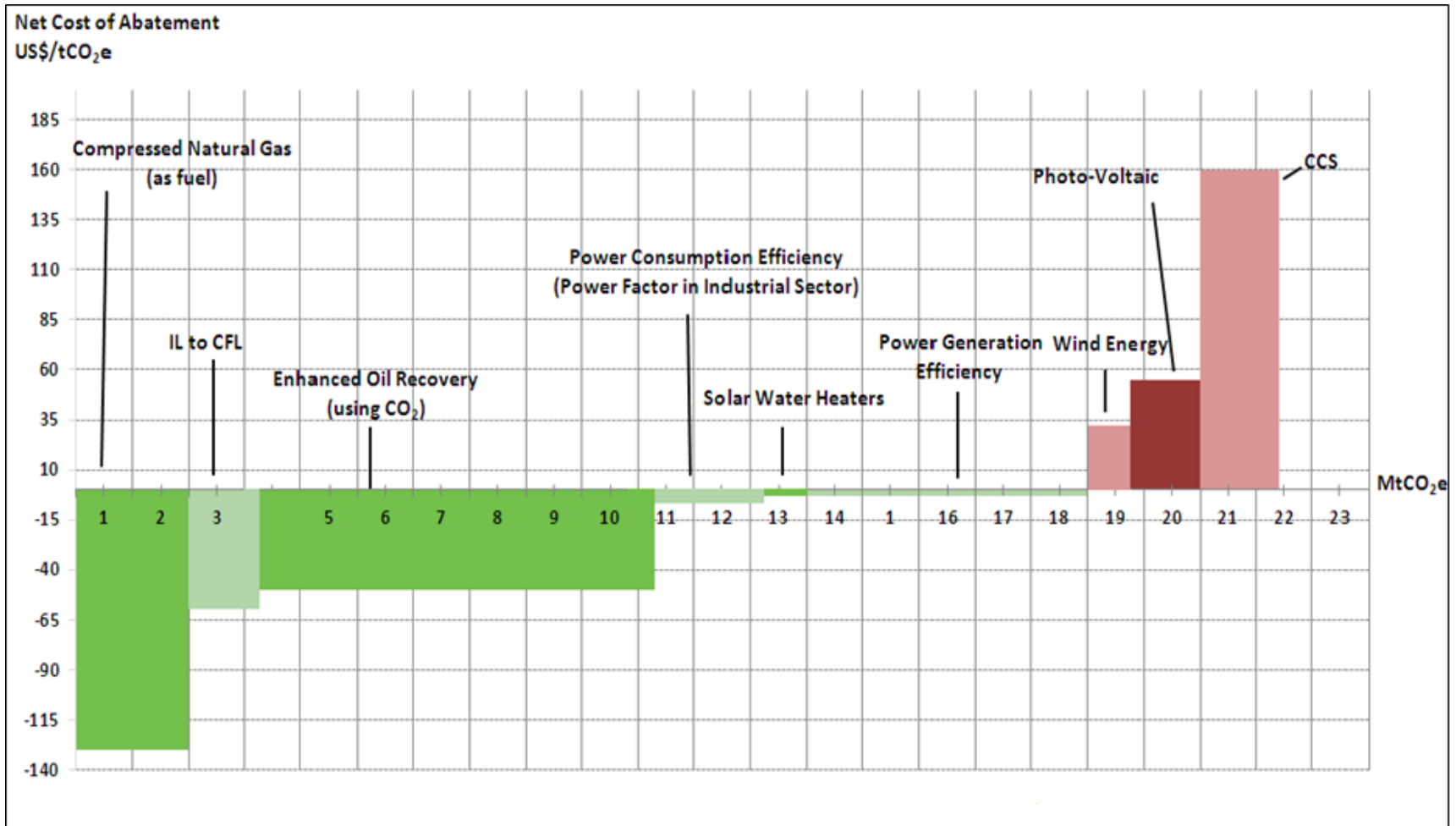
Comparison of T&T's Emissions with World's Average

Parameter	T&T's Case	World Average IPCC, 2006
GHG Emissions	53 MT	716 MT
Emissions from Oil	8%	37%
Emissions from Gas	84%	20%
Emissions from Power Generation	23%	41%
Emissions from Transport Sector	6%	22%
Emissions from Petrochemicals/Manufacture	58%	22%

Which Quadrant do you Think T&T is in?



Some of the “Low-Hanging” Mitigation Techniques for T&T

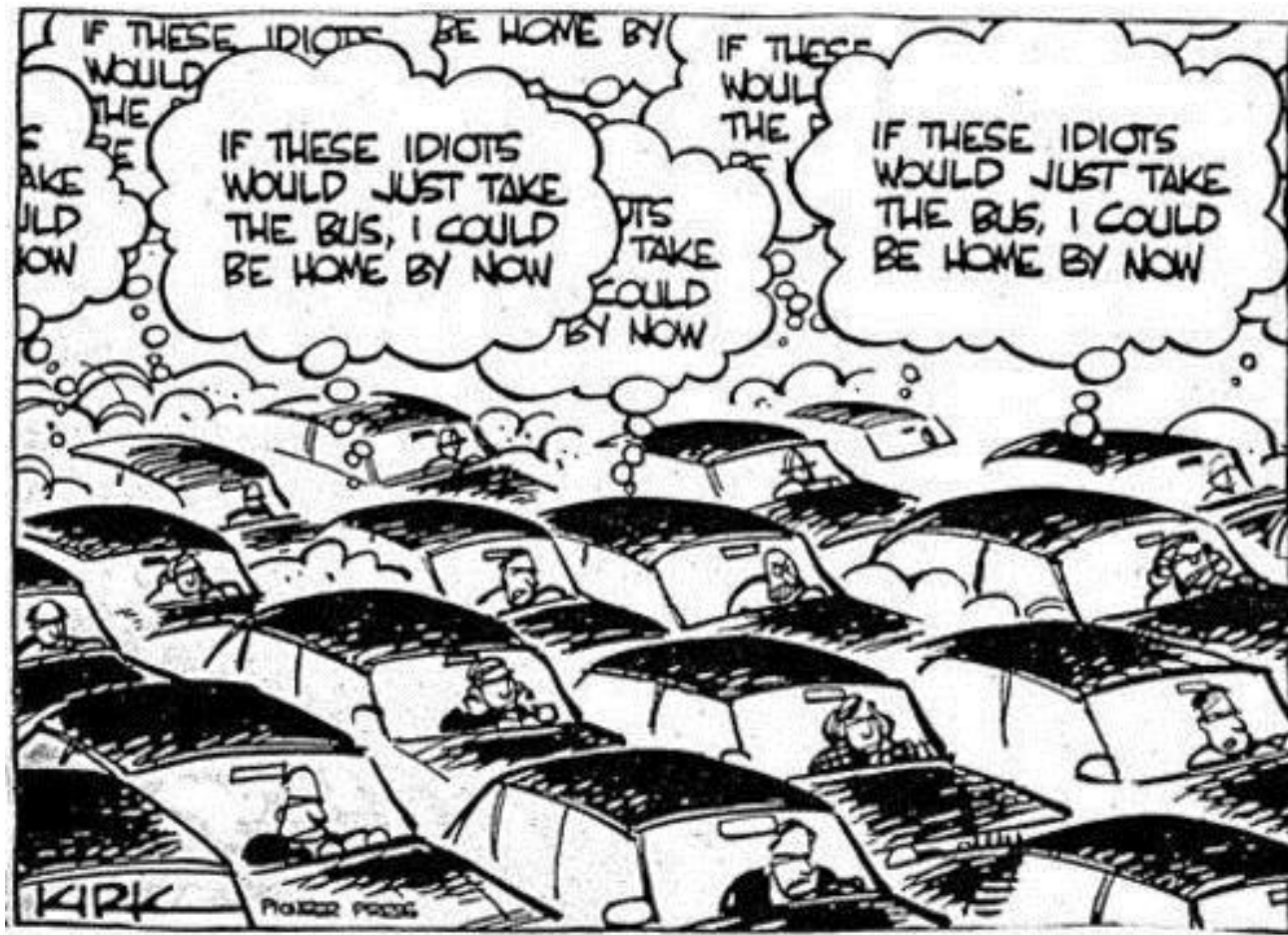


Conclusions/Key Findings

- Though T&T's economy is largely energy dependent due to the heavy reliance on natural gas based downstream industries, the nation is one of the least energy efficient.
- There are plans to add further downstream industries to T&T. In order for these and existing plants to be sustainable, they must utilise energy more efficiently.
- **Perhaps the cost of natural gas should be based on the energy efficiency of plants so that industries are motivated to become more energy efficient.**
- In addition, since the reserve to production ratio for natural gas in T&T is less than 10 years, support for further exploration initiatives is needed.

Conclusions/Key Findings

- The pattern of GHG emissions in T&T is significantly different from that of most other countries.
- Effective GHG mitigation strategies in T&T are substantially different from those used in most other countries.
- A potential reduction of close to 40 % of 2010 levels is possible. Of this reduction potential, a significant amount (85%) is possible at a “negative cost” to the economy.
- Two of the most promising cost-effective GHG strategies are:
 - Fuel switching to CNG in the Transportation sector (US \$ 130/tonne CO_{2e}), and
 - CO₂-EOR in the Petrochemical sector (US \$ 50/tonne CO_{2e}).
- A favourable response is needed from key stakeholders (Government, Business and Consumers).



Thank You